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ABSTRACT

Data from the Cooperative Institutional Research Program Follow-Up Surveys were used to study student retention at four-year colleges and universities. Data used were from the 1985-1988 follow-up surveys of 1981-1984 freshmen. Student data were also requested directly from the institutions themselves, concerning degree earned, number of years completed, admission test scores, and current enrollment status. Three retention measures were utilized: (1) received a bachelor's degree 4 years after college entry; (2) received a bachelor's degree 4 years after college entry or had completed 4 years of course work; and (3) received a bachelor's degree, or completed 4 years, or was enrolled in the fifth year. Individual characteristics that were found to be positively correlated with retention included high-school grade point average, admission test scores, and being female. Prediction equations were developed with the use of multiple regression in order to allow institutional researchers and policymakers to assess an institution's ability to retain students. Results can be used by researchers to statistically control for the influence that student characteristics have on retention, and then make valid inferences about the effect that the college environment has upon retention. Includes eight references. (JDD)

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Evaluating College Student Retention: Comparative National Data from the 1981-1984 Entering Freshman Classes

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Evaluating College Student Retention: Comparative National Data from the 1981–1984 Entering Freshman Classes

The rate at which students complete college continues to be a topic of great interest to both researchers and policy-makers. In addition to basic concerns about the functioning of colleges and universities, questions raised by student equity and diversity issues have encouraged college officials to understand and take action on factors influencing student retention rates (Astin, Korn, & Green, 1987). While a great deal of progress has been made in developing useful theoretical explanations for why students leave college before graduating (Tinto, 1987; Astin, 1977), the lack of appropriate comparative data has made it difficult for institutions to fully utilize these advances.

Several hurdles must be overcome before one can make meaningful comparisons of institutional retention rates. To begin with, developing a universally appropriate measure of student retention is problematic. A measure of retention that meets the needs of one institution may not be useful at another. For example, a college that enrolls a student population that is primarily full-time and residential might prefer a stringent measure of student progress and retention, such as graduation in four years. Applying this measure to an institution enrolling a large number of part-time commuter students would not yield an appropriate or meaningful comparative figure.

Beyond such basic definitional problems, it can also be highly misleading to directly compare retention rates at different types of colleges and universities (Astin et al., 1987). Over and above any effects of the institutional experience itself, an institution's retention rate can be greatly affected by the kinds of students it recruits and enrolls (Astin, Green, Korn, Schalit, Dey, & Hurtado, 1988; Astin et al., 1987). Thus, the only reasonable way to compare retention rates is to first take into account the large differences in the likelihood of institution's entering classes to persist.

In order to address these shortcomings, data from the Cooperative Institutional Research Program (CIRP) were used to study student retention at four-year colleges and universities. Since 1982, the CIRP has been conducting regular follow-up surveys (FUS) of entering classes of college freshmen. These longitudinal follow-ups are useful in assessing a wide-range of student experiences and achievement during their undergraduate years and determining how different college environments influence student development. In this paper, these data are used to illustrate how retention rates are influenced by student characteristics. In addition, analyses are presented that researchers and evaluators can use in conducting single- and multi-institutional studies of retention rates.

Methodology

Data were obtained from the annual CIRP Follow-Up Surveys (FUS) sponsored by the American Council on Education and the Higher Education Research Institute at UCLA. The data used in this study were taken from the 1985 FUS of 1981 Freshmen (see Astin et al., 1988), 1986 FUS of 1982 Freshmen (see Dey & Astin, 1989), 1987 FUS of 1983 Freshmen (see Hurtado, Astin, Korn & Dey, 1989), and the 1988 FUS of 1984 Freshmen.

In conjunction with the FUS survey project, which solicits information from a stratified random sample of about seven percent of participants in the CIRP freshman survey project four years earlier, academic information was acquired directly from institutions. Rosters of student names in the follow-up sample were sent to CIRP institutional representatives requesting the following information on each student: degree earned (if any), number of years completed, admission test

scores (SAT or ACT), and whether or not the student was still enrolled. These registrar's data form the basis of this retention study.

CIRP registrar's data are well suited for retention research since it lacks within-institution bias (each institution that provides such data provides it on all its students). In addition, there are no measurable differences, within stratification cells, between institutions providing registrar's data and those failing to do so in characteristics such as size, selectivity, expenditures, type, and control (see Astin, 1982). Thus, registrar's data appear to be provided on an unbiased sub-sample of the original follow-up sample.

Response rates to the registrar's survey averaged 62 percent for the four years under study (see Table 1). Although response rates to the survey varied considerably, the overall return rates are quite reasonable especially given the large number of students being sampled. It should be noted that the especially low response rate to the survey for the 1984 cohort is most likely due to the large number of students being followed up due to oversampling of minority students. The increase in work required to fill out the survey (especially for those institutions enrolling a large number of minority students) apparently motivated many institutions not to participate.

Table 1
Registrar's Survey Response Rates by Institutional Type

	Freshman Class			
Institutional Type	1981	1982	1983	1984
All Four-year Institutions	60.8	71.3	59.7	54.8
Universities				
Public	66.8	51.9	48.1	51.9
Private	57.0	81.2	67.8	48.0
Four-year Colleges				
All Public	51.4	78.5	59.9	43.9
All Private	63.2	73.6	63.7	66.3
Nonsectarian	74.0	80.4	51.7	53.0
Catholic	64.5	67.6	73.7	72.2
Protestant	60.8	81.8	79.9	77.7
N of Student Data Received	5,645	8,880	8,004	11,140

Weights were generated to correct for differences in response rates *between* stratification cells and to adjust for differences between the CIRP freshman population and the national distribution of men and women across stratification cells. The procedure used to generate weights for the registrar's data involved generating weights (computed separately for males and females) so that the weighted totals in each stratification cell were inflated to equal the total number of first time, full time freshmen entering colleges in that cell during the student's freshman year. All analyses presented in this paper are based upon weighted data.

Since this paper is focused on retention rates at four-year colleges and universities, students who entered community colleges as freshmen were excluded from analysis. In addition, these analyses are limited to full-time freshmen who aspired to a earn a bachelor's or higher degree. This final restriction is important since failure to control for the initial educational aspirations of students can result in artificially low estimates of student retention rates.

In order to provide retention measures useful for various institutional settings, the three four-year retention measures utilized were:

1. Received a bachelor's degree four years after college entry.

2. Received a bachelor's degree four years after college entry ***or*** had been completed four years of course work.

3. Received a bachelor's degree, ***or*** completed four years, ***or*** was enrolled in the fall term of the fifth year after college entry.

Of course, each of these measures has advantages and disadvantages. The first one is the most stringent of all for it classifies as dropouts all students taking longer than four years to complete a bachelor's degree. While many students who fail to graduate within four years eventually do graduate, previous research (Astin, 1975; 1982) has shown that in terms of entering student characteristics these students are more like those who never finish than those who complete a B.A. in four years. The second retention measure adds as persisters those who completed four years of undergraduate work during the four years following their initial enrollment, regardless of whether they obtained a bachelor's degree during that period. Finally, the third measure is the most liberal for it also classifies students who enrolled during the fall of the fifth year following their initial enrollment as persisters, regardless of their previous enrollment pattern.

Results

A preliminary look at the trends in the data show that retention rates have generally been increasing over the past few years. Table 2 shows that this pattern holds true for all three retention measures. Although the percentage of students completing a degree within four years of entry dropped slightly with the 1984 entering freshman class, this drop does not eliminate the general increase that preceded it. In fact, these figures are comparable to those reported by Tinto (1987, p. 27) who noted that 36.1 percent of 1972 high school graduates who entered college earned a B.A. within four years. While this trend is encouraging, it should be noted that rates are well below those reported in the past. For example, Astin (1972) reported that nearly one-half (46.7 percent) of 1966 freshmen obtained bachelor's degrees after four years. For whatever reason, it would appear that retention rates for students entering four-year institutions have declined substantially during the past sixteen years; analyses of subsequent cohorts of freshmen will determine if the increased retention rate is indeed representative of a long-term trend.

Given the possibility of sampling variability (as well as possible response bias between cohorts) influencing results, the remaining crosstabular analyses were conducted separately for each of the entering freshman classes and then averaged across years. Although this approach will obscure any trend in retention rates, the small magnitude of the increase in overall retention rates coupled with an increased ability to generate stable estimates of retention rates more than offsets this limitation.

Table 2
Retention Rates Among Students Entering Four-Year Colleges and Universities, 1981-1984

	Percentage of Students Who		
Freshman Class	Received a BA degree after four years	Received BA, or enrolled for four years	Received BA, four years of enrollment, or enrolled fall of fifth year
1981	31.2	44.2	52.2
1982	33.5	45.8	55.8
1983	37.4	47.4	57.5
1984	36.3	51.2	59.3
Average	34.6	47.2	56.2

Table 3 shows averaged retention rates broken down by gender. While women are more likely than are men to obtain a bachelor's degree within four years (37.1 versus 32.0 percent), the retention rates for men and women become more similar for the more liberal retention measures. The reasons for this finding are not clear. Men may be more likely to enroll in academic programs such as engineering and architecture that take longer than four years to complete. Alternately, women may be less likely to take time off prior to finishing their bachelor's degree.

Table 3
Retention Rates by Student Sex, 1981-1984 Freshmen

	Percentage of Students Who		
Student Sex	Received a BA degree after four years	Received BA, or enrolled for four years	Received BA, four years of enrollment, or enrolled fall of fifth year
Men	32.0	46.1	56.2
Women	37.1	48.1	56.2
Average	34.6	47.2	56.2

Table 4 shows that student retention is strongly related to basic institutional characteristics. Retention rates at public institutions are substantially lower than those at all types of private institutions. A student entering a private university is more than twice as likely to complete a bachelor's degree within four years as is one entering a public college (58.9 versus 24.9 percent). It should be noted that differences in retention rates between public and private institutions diminish somewhat as the measure of retention becomes less stringent. This suggests that students at public institutions simply take longer to complete their bachelor's degrees than do students at private institutions.

Table 4
Retention Rates by Institutional Type, 1981-1984 Freshmen

	Percentage of Students Who		
Institutional Type	Received a BA degree after four years	Received BA, or enrolled for four years	Received BA, four years of enrollment, or enrolled fall of fifth year
Public University	30.1	49.1	60.8
Private University	58.9	70.2	74.0
Public College	24.9	36.4	49.0
Nonsectarian College	45.7	52.7	56.1
Catholic College	45.9	54.1	58.1
Protestant College	45.3	51.9	55.1

What accounts for these large differences? As noted earlier, the retention rates at any institution can be greatly affected by the kinds of students it enrolls, over and above any effects of the institutional experience itself. For example, Table 5 shows the retention rates of students with different high school grade point averages. A student with high school grades averaging A or A+ is over six times as likely (58.2 versus 9.5 percent) to complete a bachelor's degree in four years as a student whose high school grades were below C+. Again, it should be noted that differences in retention rates by grade level become smaller as the retention measure becomes less stringent.

Table 5
Retention Rates by High School Grades, 1981-1984 Freshmen

	Percentage of Students Who		
H.S. Grades	Received a BA degree after four years	Received BA, or enrolled for four years	Received BA, four years of enrollment, or enrolled fall of fifth year
A, A+	58.2	69.3	74.3
A-	48.6	61.9	68.6
B+	38.4	51.5	60.1
B	28.0	41.6	52.3
B-	21.1	33.3	45.9
C+	15.6	26.7	38.0
C or Less	9.5	17.6	27.7

Table 6 shows retention rates by admission test scores. Once again, we find that student characteristics play a large role in an institution's retention rate. Students with the highest test scores (1300 or higher) are over five times more likely (69.0 percent versus 12.2 percent) to get a

bachelor's degree in four years than those in the lowest test score intervals (below 700). Using the less stringent retention measures provide similar results.

Table 6
Retention Rates by Admissions Test Scores, 1981-1984 Freshmen

	Percentage of Students Who		
*SAT Verbal + Math Score**	Received a BA degree after four years	Received BA, or enrolled for four years	Received BA, four years of enrollment, or enrolled fall of fifth year
1300 +	69.0	77.4	82.6
1225-1299	60.5	71.2	77.1
1150-1224	55.0	66.4	72.6
1075-1149	49.3	63.0	71.3
1000-1074	45.8	58.7	66.7
925-999	34.5	49.1	59.2
850-924	30.6	44.6	55.8
775-849	27.8	43.5	54.8
700-774	21.5	33.8	46.0
Below 700	12.2	23.7	33.1

*ACT scores converted to SAT equivalents following Astin, Henson, & Christian (1978).

How do test scores and high school grades predict retention when they are used in combination? Table 7 shows the results of such analyses for students completing a bachelor's degree in four years. Differences in retention rate from the lower left (low test scores, low high school grades) to the upper right corners (high scores, high grades) are exceptionally large: Students with A averages in high school and SAT scores exceeding 1300, for example, are twelve times more likely to get a bachelor's degree in four years than students with an average of C+ in high school and SAT's below 700 (78 percent versus 6 percent). Table 7 provides ample evidence that high school grade and admissions test scores are important indicators of a student's chances of finishing college, especially when these measures are considered over the full range of scores.

Table 7
Percent Receiving Bachelor's Degrees by High School Grades and Test Scores

*SAT Verbal + Math Score**	*High School Grades*						
	C or less	C+	B-	B	B+	A-	A, A+
1,300+						65	78
1,150-1,299				44	51	62	65
1,000-1,149		27	33	38	48	55	59
850-999	18	18	24	28	37	53	44
700-849	7	19	22	25	28	40	
Less Than 700	6	5	12	14	16		

*ACT scores converted to SAT equivalents following Astin, Henson & Christian (1978).
Note: Yearly percentages based on unweighted n's of less than 75 are omitted.

Predicting Retention

Given the obvious fact that a college's retention rate necessarily depends to some extent on the academic preparation of its entering freshmen, it is difficult for any institution to evaluate its own retention rate without also taking into account the characteristics of the students it admits as freshmen. Accordingly, several tables are provided which will enable any four-year institution to assess its own retention rate. The basic procedure is to calculate an "expected" retention based upon the characteristics of the entering freshmen and then to compare this expected rate with the actual rate. If the two rates are close, then the institution's ability to retain its students is comparable to that of institutions in general. If the actual retention rate is significantly higher than the expected rate, then the institution is having unusual success in retaining its students. On the other hand, if the actual rate is substantially less than the expected rate, then the institution may wish to examine its programs and practices with an eye to strengthening its ability to retain its students.

To provide institutions with a basis for evaluating their own retention rates, Appendix A contains 15 tables which will allow institutions to estimate their "expected retention rate" using different sets of basic student input characteristics. Tables are provided for each of the three retention measures described above for several institutional breakdowns. Tables A1 through A3 allow institutions to compare their retention rates against all four-year institutions. Tables A4 through A15 provide four sets of retention data for the following institutional groupings: Public universities, public four-year colleges, private universities, private four-year colleges.

For example, Table A1 shows equations for estimating the probability that student will complete a bachelor's degree within four years using three different sets of entering freshman characteristics. The first formula, based on only the students' average grade in high school, is provided for institutions that do not have tests scores available for their entering freshmen. The coefficients shown in the column under the numeral '1' show this simple equation in the usual linear form:

$$\hat{y} = a + bx \qquad (i)$$

where $\hat{y}$ is the expected probability of retention (earning a bachelor's degree in four years), a is the intercept or constant (.8957), b is the coefficient (.0881) to be multiplied by the students' average grade in high school, and x is the students' average grade in high school. Substituting the actual values for the constants in equation 1, we end up with the following equation for estimating the students' chances of persisting through to the bachelor's degree within four years as follows: students' predicted chance of persisting is equal to:

$$\hat{y} = .8957 + .0881 * x \qquad (ii)$$

The computations are very straightforward. For example, if the student enters college with an A or A+ average from high school (which receives a code of '8' in the freshman questionnaire), then that student's probability of getting a bachelor's degree in four years is about 60 percent. This is calculated by substituting the values into equation 2, as in:

$$1.60 = .8957 + .0881 * (8)$$

(Note that it is necessary to subtract 1 from $\hat{y}$ in order to get the correct percentage since retention has been coded as '2' = yes, '1' = no). Conversely, a student with only a C+ average (coded as '2' in the freshman questionnaire), has only a .07 probability of completing the bachelor's degree in four years, since

$$1.07 = .8957 + .0881 * (2)$$

The second formula in Table A1 (in the column under the numeral '2') is provided for institutions that have information on both high school grades and admission test scores. The formula assumes that SAT scores are being used, although we have developed a conversion table which allows institutions that use the ACT to convert those scores into SAT equivalents (see Appendix B). The formula is used in the standard multiple regression format:

$$\hat{y} = a + b_1x_1 + b_2x_2 \qquad (iii)$$

where x_1 is the students' high school grades (recoded, as above, to an 8-point scale), and where x_2 is the students' SAT composite score. Thus, substituting the values from the second equation in Table A1 into equation iii above, the students' probability of attaining a bachelor's degree in four years is equal to:

$$\hat{y} = .4894 + .0517*x_1 + .000627*x_2$$

Thus, if a student has a high school grade average of A or A+ (coded '8' in the freshman questionnaire) and an SAT composite (verbal plus math) score of 1500, that student's chances of completing a bachelor's degree in four years is equal to:

$$1.84 = .4894 + .0517 * (8) + .000627 * (1500)$$

or 84 percent (remember to subtract 1 from the above result). By contrast, the probability for a student with a C+ average (coded '2') and an SAT composite of only 700, is only about 3 percent:

$$1.03 = .4894 + .0517 * (2) + .000627 * (700)$$

The third formula in Table A1 (under numeral '3') is provided because it was found that women are slightly more likely than men to complete the bachelor's degree in four years, after taking into account differences in high school grades and SAT composite scores. Institutions that wish to take into account the sex ratio in their student bodies thus can use the three-variable equation which includes sex as well as test scores and high school grades.

Because of the additive nature of multiple regression analysis, an institution can avoid having to compute expected probabilities of retention for individual students if it already has available the aggregated data on its freshman class for the relevant freshmen characteristics. Thus, it would be necessary to use only the mean scores of entering freshmen on each of the characteristics shown in Appendix A in order to compute a mean expected retention probability for the entire entering class.

To illustrate use of the regression tables found in Appendix A, we have computed the mean expected retention rate using equation 3 in Table A1 for six institutions in a special sub-sample of the 1988 follow-up survey population. By comparing the expected retention rates with the actual retention rates it is possible to examine how successful institutions are in retaining students, after taking into account the student characteristics that affect retention.

Table 8 shows expected versus actual retention rates broken down by institution. Institutions C and E have higher than expected (or predicted) retention rates while Institutions A and B are markedly lower than expected. At Institution E one-third (33 percent) more students graduate in four years than we would expect given the characteristics of students attending. Similarly, over one-fifth (22 percent) more students graduate from Institution C than expected. Institution B, a public four-year college, does worse than average—29 percent less students graduate within four years than we predicted. However, it should be noted that if we used the equations for public colleges (Tables A-7 through A-9) instead of for all institutions, Institution B would fare somewhat better since public colleges have the lowest retention rate of any institutional type. The retention rates at Institutions D and F are almost exactly as expected, showing that after taking into account student characteristics they are having average success in terms of retention.

Table 8
Actual versus Expected Retention Rates, 1988 Registrar's Survey of 1984 Freshmen

		Percentage Earning Bachelor's Degree		
Institution	*Control and Type*	Actual	Expected	Residual
A	Public university	.22	.36	-.14
B	Public four-year	.11	.40	-.29
C	Public four-year	.78	.56	.22
D	Private university	.29	.30	-.01
E	Private four-year	.87	.54	.33
F	Private four-year	.49	.52	-.03

Summary and Conclusion

Using data from the 1981-1984 CIRP Registrar's Surveys, numerous individual student and institutional characteristics are shown to be related to retention. Individual characteristics that are positively correlated with retention include high school grade point average, admission test scores, and being female. These student characteristics can strongly influence an institution's retention rate, thereby making it necessary to first control for these characteristics comparing institutional retention rates.

Prediction equations are developed with the use of multiple regression in order to allow institutional researchers and policy-makers to more adequately assess an institution's ability to retain students. The study generates national comparative data that will be useful for researchers and policy-makers alike. Many retention studies ignore the fact that a student's precollege characteristics can play a large role in determining an institution's retention rate. The results of this study can be used by researchers to statistically control for the influence that these student characteristics have on retention.

Once student characteristics have been controlled for, researchers and policy-makers can study and make valid inferences about the effect that the college environment has upon retention and turn their attention towards developing environments that are conducive to promoting retention. For instance, in the example given above, it would be interesting to know how Institutions E and F differ. Although they are both private four-year colleges, the difference in their actual retention is dramatic (87 versus 49 percent) their expected retention rates are almost identical (54 versus 52 percent). What accounts for the difference? Are these differences due to different levels of academic preparation or motivation of incoming students (i.e., background characteristics not controlled by the prediction equation) or due to differences in student involvement or integration once the students are on campus? Do other institutional characteristics, such as size or urban vs. rural setting, help explain the difference in retention rate? Regardless of what combination of factors explains the difference in this example, note that it is only by first controlling for basic student characteristics that these important questions can be brought into focus. By using national comparative data, institutions can more realistically assess their own retention rates and their influence upon it.

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Appendix A

Retention Prediction Tables

Table A1
Equations for Estimating Probability of Completing Bachelor's Degree: All Institutions[a] (Unweighted N = 7,495)

	Coefficient (b) Associated With Predictor in Equation		
Predictor	1	2	3
Average grade in high school[b]	.0881	.0517	.0484
SAT Composite[c]		.000627	.000658
Student is Female[a]			.0389
Constant (a)	.8957	.4894	.4189
Multiple R	.2994	.3701	.3830

[a]Yes.= 2; no = 1.
[b]Recoded into eight-point scale: A or A+ = 8; A- = 7; B+ = 6; B = 5; B- = 4; C+ = 3; C or C- = 2; D or less = 1.
[c]Verbal plus math score; ACT scores converted into SAT equivalents following Astin, Henson, & Christian (1978).

Table A2
Equations for Estimating Probability of Completing Bachelor's Degree or Fours Years of Enrollment: All Institutions[a] (Unweighted N = 7,495)

	Coefficient (b) Associated With Predictor in Equation		
Predictor	1	2	3
Average grade in high school[b]	.0943	.0611	
SAT Composite[c]		.000572	
Constant (a)	.9985	.6275	
Multiple R	.3126	.3678	

[a]Yes = 2; no = 1.
[b]Recoded into eight-point scale: A or A+ = 8; A- = 7; B+ = 6; B = 5; B- = 4; C+ = 3; C or C- = 2; D or less = 1.
[c]Verbal plus math score; ACT scores converted into SAT equivalents following Astin, Henson, & Christian (1978).

Table A3
Equations for Estimating Probability of Completing Bachelor's Degree, Fours Years of Enrollment, or Being Enrolled Fall of Fifth Year: All Institutions[a] (Unweighted N = 7,495)

	Coefficient (b) Associated With Predictor in Equation		
Predictor	1	2	3
Average grade in high school[b]	.0742	.0474	
SAT Composite[c]		.000464	
Constant (a)	1.2020	.9011	
Multiple R	.2529	.3000	

[a]Yes = 2; no = 1.
[b]Recoded into eight-point scale: A or A+ = 8; A- = 7; B+ = 6; B = 5; B- = 4; C+ = 3; C or C- = 2; D or less = 1.
[c]Verbal plus math score; ACT scores converted into SAT equivalents following Astin, Henson, & Christian (1978).

Table A4
Equations for Estimating Probability of Completing Bachelor's Degree: Public Universities[a] (Unweighted N = 1,693)

	Coefficient (b) Associated With Predictor in Equation		
Predictor	1	2	3
Average grade in high school[b]	.0975	.0754	.0644
SAT Composite[c]		.000421	.000531
Student is Female[a]			.1114
Constant (a)	.8158	.5235	.3105
Multiple R	.3241	.3530	.3690

[a]Yes = 2; no = 1.
[b]Recoded into eight-point scale: A or A+ = 8; A- = 7; B+ = 6; B = 5; B- = 4; C+ = 3; C or C- = 2; D or less = 1.
[c]Verbal plus math score; ACT scores converted into SAT equivalents following Astin, Henson, & Christian (1978).

Table A5
Equations for Estimating Probability of Completing Bachelor's Degree or Fours Years of Enrollment: Public Universities[a] (Unweighted N = 1,693)

	Coefficient (b) Associated With Predictor in Equation		
Predictor	1	2	3
Average grade in high school[b]	.1071	.0837	
SAT Composite[c]		.000445	
Constant (a)	.9910	.6817	
Multiple R	.3525	.3818	

[a]Yes = 2; no = 1.
[b]Recoded into eight-point scale: A or A+ = 8; A- = 7; B+ = 6; B = 5; B- = 4; C+ = 3; C or C- = 2; D or less = 1.
[c]Verbal plus math score; ACT scores converted into SAT equivalents following Astin, Henson, & Christian (1978).

Table A6
Equations for Estimating Probability of Completing Bachelor's Degree, Fours Years of Enrollment, or Being Enrolled Fall of Fifth Year: Public Universities[a] (Unweighted N = 1,693)

	Coefficient (b) Associated With Predictor in Equation		
Predictor	1	2	3
Average grade in high school[b]	.0832	.0667	
SAT Composite[c]		.000314	
Constant (a)	1.2141	.9955	
Multiple R	.2899	.3099	

[a]Yes = 2; no = 1.
[b]Recoded into eight-point scale: A or A+ = 8; A- = 7; B+ = 6; B = 5; B- = 4; C+ = 3; C or C- = 2; D or less = 1.
[c]Verbal plus math score; ACT scores converted into SAT equivalents following Astin, Henson, & Christian (1978).

Table A7
Equations for Estimating Probability of Completing Bachelor's Degree: Private Universities[a] (Unweighted N = 810)

	Coefficient (b) Associated With Predictor in Equation		
Predictor	1	2	3
Average grade in high school[b]	.0779	.0436	.0380
SAT Composite[c]		.000523	.000593
Student is Female[a]			.0948
Constant (a)	1.1444	.7788	.5990
Multiple R	.2226	.2879	.3035

[a]Yes = 2; no = 1.
[b]Recoded into eight-point scale: A or A+ = 8; A- = 7; B+ = 6; B = 5; B- = 4; C+ = 3; C or C- = 2; D or less = 1.
[c]Verbal plus math score; ACT scores converted into SAT equivalents following Astin, Henson, & Christian (1978).

Table A8
Equations for Estimating Probability of Completing Bachelor's Degree or Fours Years of Enrollment: Private Universities[a] (Unweighted N = 810)

	Coefficient (b) Associated With Predictor in Equation		
Predictor	1	2	3
Average grade in high school[b]	.0535	.0339	
SAT Composite[c]		.000297	
Constant (a)	1.4443	1.2364	
Multiple R	.1801	.2178	

[a]Yes = 2; no = 1.
[b]Recoded into eight-point scale: A or A+ = 8; A- = 7; B+ = 6; B = 5; B- = 4; C+ = 3; C or C- = 2; D or less = 1.
[c]Verbal plus math score; ACT scores converted into SAT equivalents following Astin, Henson, & Christian (1978).

Table A9
Equations for Estimating Probability of Completing Bachelor's Degree, Fours Years of Enrollment, or Being Enrolled Fall of Fifth Year: Private Universities[a] (Unweighted N = 810)

	Coefficient (b) Associated With Predictor in Equation		
Predictor	1	2	3
Average grade in high school[b]	.0582	.0368	
SAT Composite[c]		.000325	
Constant (a)	1.4416	1.2142	
Multiple R	.2072	.2509	

[a]Yes = 2; no = 1.
[b]Recoded into eight-point scale: A or A+ = 8; A- = 7; B+ = 6; B = 5; B- = 4; C+ = 3; C or C- = 2; D or less = 1.
[c]Verbal plus math score; ACT scores converted into SAT equivalents following Astin, Henson, & Christian (1978).

Table A10
Equations for Estimating Probability of Completing Bachelor's Degree: Public Colleges[a] (Unweighted N = 1,581)

	Coefficient (b) Associated With Predictor in Equation		
Predictor	1	2	3
Average grade in high school[b]	.0679	.0342	.0392
SAT Composite[c]		.000704	.000653
Student is Female[a]			-.0561
Constant (a)	.9008	.4260	.5990
Multiple R	.2387	.3538	.3588

[a]Yes = 2; no = 1.
[b]Recoded into eight-point scale: A or A+ = 8; A- = 7; B+ = 6; B = 5; B- = 4; C+ = 3; C or C- = 2; D or less = 1.
[c]Verbal plus math score; ACT scores converted into SAT equivalents following Astin, Henson, & Christian (1978).

Table A11
Equations for Estimating Probability of Completing Bachelor's Degree or Fours Years of Enrollment: Public Colleges[a] (Unweighted N = 1,581)

	Coefficient (b) Associated With Predictor in Equation		
Predictor	1	2	3
Average grade in high school[b]	.0769	.0497	.0559
SAT Composite[c]		.000566	.000502
Student is Female[a]			-.0697
Constant (a)	.9766	1.2364	.7264
Multiple R	.2458	.3114	.3185

[a]Yes = 2; no = 1.
[b]Recoded into eight-point scale: A or A+ = 8; A- = 7; B+ = 6; B = 5; B- = 4; C+ = 3; C or C- = 2; D or less = 1.
[c]Verbal plus math score; ACT scores converted into SAT equivalents following Astin, Henson, & Christian (1978).

Table A12
Equations for Estimating Probability of Completing Bachelor's Degree, Fours Years of Enrollment, or Being Enrolled Fall of Fifth Year: Public Colleges[a] (Unweighted N = 1,581)

	Coefficient (b) Associated With Predictor in Equation		
Predictor	1	2	3
Average grade in high school[b]	.0483	.0299	
SAT Composite[c]		.000383	
Constant (a)	1.2828	1.0243	
Multiple R	.1517	.1979	

[a]Yes = 2; no = 1.
[b]Recoded into eight-point scale: A or A+ = 8; A- = 7; B+ = 6; B = 5; B- = 4; C+ = 3; C or C- = 2; D or less = 1.
[c]Verbal plus math score; ACT scores converted into SAT equivalents following Astin, Henson, & Christian (1978).

Table A13
Equations for Estimating Probability of Completing Bachelor's Degree: Private Colleges[a] (Unweighted N = 3,411)

	Coefficient (b) Associated With Predictor in Equation		
Predictor	1	2	3
Average grade in high school[b]	.0918	.0611	.0557
SAT Composite[c]		.000531	.000569
Student is Female[a]			.0673
Constant (a)	.9724	.6327	.5231
Multiple R	.3243	.3698	.3755

[a]Yes = 2; no = 1.
[b]Recoded into eight-point scale: A or A+ = 8; A- = 7; B+ = 6; B = 5; B- = 4; C+ = 3; C or C- = 2; D or less = 1.
[c]Verbal plus math score; ACT scores converted into SAT equivalents following Astin, Henson, & Christian (1978).

Table A14
Equations for Estimating Probability of Completing Bachelor's Degree or Fours Years of Enrollment: Private Colleges[a] (Unweighted N = 3,411)

	Coefficient (b) Associated With Predictor in Equation		
Predictor	1	2	3
Average grade in high school[b]	.0893	.0608	.0580
SAT Composite[c]		.000492	.000511
Student is Female[a]			.0345
Constant (a)	1.064	.7492	.6929
Multiple R	.3151	.3556	.3572

[a]Yes = 2; no = 1.
[b]Recoded into eight-point scale: A or A+ = 8; A- = 7; B+ = 6; B = 5; B- = 4; C+ = 3; C or C- = 2; D or less = 1.
[c]Verbal plus math score; ACT scores converted into SAT equivalents following Astin, Henson, & Christian (1978).

Table A15
Equations for Estimating Probability of Completing Bachelor's Degree, Fours Years of Enrollment, or Being Enrolled Fall of Fifth Year: Private Colleges[a] (Unweighted N = 3,411)

	Coefficient (b) Associated With Predictor in Equation		
Predictor	1	2	3
Average grade in high school[b]	.0776	.0476	
SAT Composite[c]		.000518	
Constant (a)	1.1704	.8389	
Multiple R	.2770	.3278	

[a]Yes = 2; no = 1.
[b]Recoded into eight-point scale: A or A+ = 8; A- = 7; B+ = 6; B = 5; B- = 4; C+ = 3; C or C- = 2; D or less = 1.
[c]Verbal plus math score; ACT scores converted into SAT equivalents following Astin, Henson, & Christian (1978).

Appendix B

Converting ACT Scores to SAT Equivalents

Appendix B

Converting ACT Scores to SAT Equivalents

The ACT equivalent was obtained by summing three ACT subtests (English, Natural Sciences, Social Sciences) and converting to ACT equivalent by the equipercentile method (N=14,865). The sum of the three (range 3-108) ACT subtests was used (rather than simply the ACT English subtest) because it resulted in a better correlation with the SAT Verbal score (r=.82 vs. r=.69). If a record had one or more of the ACT subtests missing, the entire record was dropped from the file. The resulting conversion table is shown below.

ACT Sum Eng & Nat Sci & Soc Sci	SAT Verbal	ACT Sum Eng & Nat Sci & Soc Sci	SAT Verbal	ACT Sum Eng & Nat Sci & Soc Sci	SAT Verbal
108	800	70	480	32	280
107	800	69	480	31	270
106	800	68	470	30	260
105	800	67	460	29	260
104	800	66	460	28	250
103	800	65	450	27	250
102	800	64	440	26	240
101	790	63	440	25	230
100	770	62	440	24	230
99	760	61	430	23	220
98	750	60	430	22	220
97	740	59	420	21	210
96	730	58	420	20	210
95	720	57	410	19	210
94	710	56	410	18	210
93	700	55	400	17 or below	200
92	690	54	400		
91	680	53	390		
90	670	52	390		
89	660	51	380		
88	640	50	380		
87	630	49	370		
86	620	48	370		
85	610	47	360		
84	600	46	360		
83	590	45	350		
82	580	44	350		
81	570	43	340		
80	560	42	340		
79	550	41	330		
78	540	40	320		
77	540	39	310		
76	530	38	310		
75	520	37	310		
74	510	36	300		
73	510	35	300		
72	500	34	290		
71	490	33	280		

ACT equivalent obtained by an equipercentile conversion of the ACT Mathematical subtest score (range 1-36) to SAT. Correlation between SAT-M and converted ACT-M is .85 (N=14,000).

ACT ACT Math	SAT Math
36	780
35	750
34	730
33	710
32	700
31	680
30	660
29	640
28	610
27	590
26	560
25	530
24	510
23	500
22	480
21	470
20	460
19	450
18	440
17	430
16	410
15	390
14	380
13	370
12	360
11	350
10	340
9	330
8	330
7	320
6	300
5	290
4	280
3	270
2	260
1	240

Note: Adapted from Astin, Henson, and Christian (1978).